



---

## The impact of platelet-rich plasma on the treatment of "frozen shoulder

Jitendra Meena<sup>1</sup>, Mahendra Kumar Gosalia<sup>1</sup>, Jitendra Aloria<sup>1</sup>, Ashok Kumar Tiwari<sup>2</sup>, Dinesh Bairwa<sup>3</sup>

<sup>1</sup> Resident, Department of Orthopaedics, Government Medical College, Kota, Rajasthan, India

<sup>2</sup> Senior Professor, Department of Orthopaedics, Government Medical College, Kota, Rajasthan, India

<sup>3</sup> Assistant Professor, Department of Orthopaedics, Government Medical College, Kota, Rajasthan, India

---

### Abstract

**Introduction:** Frozen shoulder is marked by discomfort and substantial limitations in both active and passive shoulder mobility. Lundberg divides frozen shoulder into two categories: primary and secondary (based on presence or absence of an inciting event). The majority of the time, there is no underlying sickness (locally or systemically). After a traumatic event or surgery, a secondary condition develops. PRP is a relatively recent therapy option. PRP injections are a type of autologous blood product that aids in the body's natural healing process.

**Objectives of The Study:** After therapy with PRP injection, measure the improvement in pain and mobility in frozen shoulder using the Visual analogue score (VAS) and Quick DASH score.

**Methods:** During the years 2020-2021, this research was carried out at the Department of Orthopedics, Govt Medical College and Associated Group of Hospitals, Kota. Frozen shoulder samples are obtained based on both inclusive and exclusive criteria.

**Result:** The VAS score in this research was 7.40.85 before PRP therapy, however after PRP treatment, the score was 4.9±30.73 after 2 weeks, 2.6±60.60 after 1 month, 0.8±30.69 after 3 months, and 0.1±60.46 after 6 months. Prior to PRP administration, the Quick Dash score was 52.60±6.19, but following PRP therapy, the score was 36.08±6.2 after two weeks, 23.73±5.61 after one month, 10.23±7.2 after three months, and 2.10±3.82 after six months. During each follow-up, the mean score improved consistently, and each score was statistically significant when compared to the prior follow-up.

**Conclusion:** Frozen shoulder is an inflammatory condition that causes significant capsule fibrosis and stiffness in the shoulder joint. The PRP injection uses your own autologous blood to minimize inflammation and speed up the healing process. Faster symptom alleviation reduces long-term morbidity and allows for a quicker return to normal daily activities.

**Keywords:** platelet-rich plasma, frozen shoulder

---

### Introduction

A frozen shoulder is a clinical condition, characterized by significant pain that is a result of active movement and shoulder movement that occur without the known disruption within the shoulder. Shoulder stiffness is a manifestation of a frozen shoulder. Pathologic changes in frozen shoulder to synovial inflammation and subsequent reactive capsular fibrosis. Cytokines, metalloproteinase, and factor-beta factor have been implicated in this process. Lundberg<sup>[1]</sup> developed a frozen shoulder-splitting system based on the presence or absence of a motivating event. Primary frozen shoulder begins primarily without local or systemic disease. Second frozen shoulder developed after injury or surgery resisting shoulder joint movements such as near humeral fracture, soft tissue injuries, shoulder surgery for subacromial bursitis. The clinical course of frozen (idiopathic) shoulder has three stages. The painful first phase, the frozen phase and the later retreat phase. Diagnostic tests include USG, x-ray, CT scan, MRI and arthrogram. MRI showed a contraceptive lower capsule and increased blood flow to the synovium. Treatment options include supervised physical therapy, NSAIDs, local steroids, closed surgery under anesthesia, open surgery release, and release capsular arthroscopy. PRP is a new tool in the armamentarium injections are an automatic blood product that promotes the body's natural healing process<sup>[2,3]</sup>. It is prepared by drawing a patient's blood and then twisting the sample into a centrifuge, a tool used to separate the blood components. Part of the platelet-concentrate is then removed and directed to the injured area of bone or soft tissue such as a tendon or ligament. The risk of contracting a blood-borne disease or developing anaphylactic reaction is virtually nonexistent with PRP injections<sup>[4]</sup>. PRP also generally has lower costs and shorter recovery time compared to surgical management.

### Objectives of the Study

To assess the benefits and drawbacks of PRP treatment. The purpose of this study was to see how the pain scale improved in terms of VAS and Quick DASH scores. The goal of this study was to look at the literature on platelet rich plasma treatment for frozen shoulder.

## Material and Methods

During the years 2020-2021, this research was carried out at the Department of Orthopedics, Govt Medical College and Associated Group of Hospitals, Kota.

## Criteria for Inclusion

Patients between the ages of 18 and 70, both men and females, Patients who have been diagnosed with frozen shoulder and have agreed to get therapy with autologous PRP injection and follow-up in the out-patient department according to our protocol.

## Criteria For Exclusion

If under the age of eighteen, Prior to 72 hours of PRP treatment, patients who had taken analgesics were excluded. Within one month of receiving a corticosteroid injection at the treatment location, Patients who had surgery to correct a problem with their upper limb Rheumatoid arthritis patients, gouty arthritis patients, seronegative arthropathies patients, and reactive arthritis patients' Local infection at the surgery site, coagulation and bleeding abnormalities, septicemia, and other systemic diseases 7. Patient refuses to have PRP therapy in accordance with our procedure.

## PRP (Platelet Rich Plasma) preparation

The Most investigators have used specialized kits for separating PRP from whole blood along with an anticoagulant and centrifugation.

The Whole Blood is initially collected in tubes that contain anticoagulants. The first spin 1500 rpm for 15min is performed at constant acceleration to separate RBCs from the remaining Whole Blood volume. After the first spin step, the Whole Blood separates into three layers: an upper layer that contains mostly platelets and WBC, an intermediate layer that is known as the buffy coat and that is rich in WBCs, and a bottom layer that consists mostly of RBCs. The upper layer plus buffy coat is transferred to an empty tube. The second spin 3000 rpm for 10 min is then performed. The upper portion of the volume that is composed mostly of PPP (platelet-poor plasma) is removed to create the PRP (Platelet-Rich Plasma). The concentrations of platelets and WBC in each of the various layers are measured to characterize the quality of PRP.

## Pre procedural precautions

The use of NSAIDs 72 hours before to PRP injection and steroids 4 weeks prior to PRP injection will be explored. During the pre-procedural phase, the intensity of pain is assessed using conventional grading standards. Autologous PRP injection technique in shoulder Glenohumeral joint injection Used to relieve the discomfort of a frozen shoulder that affects the shoulder.

## Glenohumeral joint injection

Used for pain relief of frozen shoulder affecting the shoulder.



Fig 1

## Follow up

We will follow up with patients on Day 7 to rule out any intervention problem. Then there are OPD-based Visits at the end of each month respectively. For every visit, patients will be tested for ROM (Range of Motion) and physical examination. Functional tests will be performed using the Visual Analogue Scale (VAS) for Pain, Rapid Disability, Shoulder, and Scale (DASH), which had 11 questions about daily activities, providing 5 possible answers (no difficulty, disability and pain, moderate pain and disability activities, severe pain and all the most disturbed activities, and chronic pain without movement).

### Visual Analogue Scale (VAS)

A Visual Analogue Scale (VAS) is a measurement tool that attempts to assess a trait or attitude that is thought to range throughout a continuum of values but is difficult to measure directly. [5] A straight horizontal line of constant length, generally 10 cm, is the simplest basic VAS. The extreme limits of the parameter to be measured (pain) [6] are defined as the extreme limits of the parameter to be measured (pain) oriented from left (no pain) to right (pain) (very severe pain).

**Table 1:** Quick Dash score

Function	No difficulty	Mild	Moderate	Severe	Extreme
Opening a jar	1	2	3	4	5
Doing heavy household chores (washing walls and floors)	1	2	3	4	5
Carrying a shopping bag	1	2	3	4	5
Washing your back	1	2	3	4	5
Using a knife to cut food	1	2	3	4	5
Recreational activities or repeated use of the arm	1	2	3	4	5
Difficulties with prolonged sitting or moving, not using the arm, during the past week	1	2	3	4	5
Limitations in the work during the past week	1	2	3	4	5
Shoulder pain	1	2	3	4	5
Tingling, unpleasant feeling in the shoulder	1	2	3	4	5
Pain during sleep	1	2	3	4	5

If there is more than one missing item, the Quick DASH score may not be calculated.

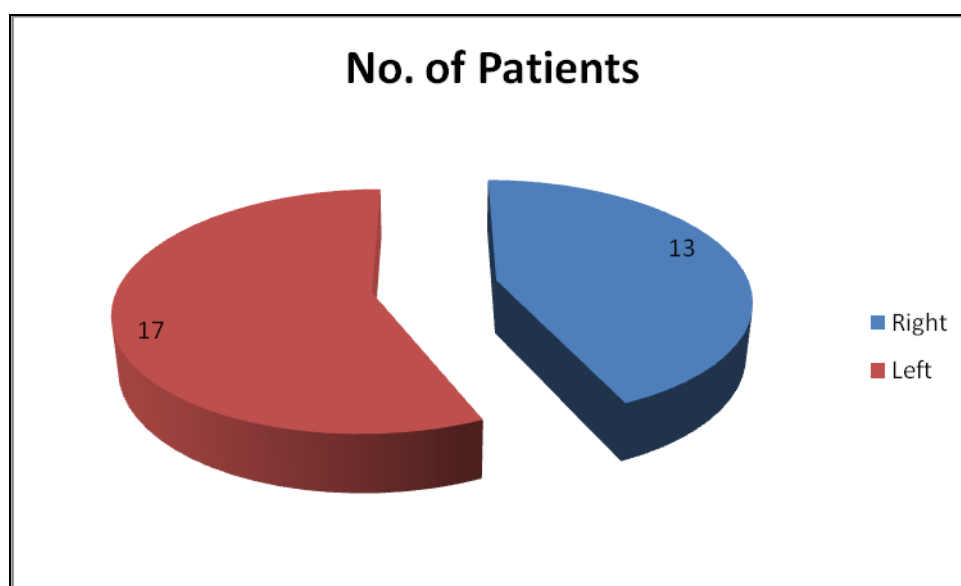
(Sum of response-1) x25/N = Quick DASH score, where n is the number of completed replies. The range of achievable scores is 0 to 100. A full, unrestricted function of the upper extremities is represented by 0 scores, whereas the worst conceivable functional limitation is represented by 100 points.

### Result

Most of the patients in our research (n=25) were between the ages of 40 and 70. At the time of the investigation, the youngest patient in the series was 32 years old, while the oldest patient was 71 years old. In the series, the average age was 54.66 years. The majority of patients are females 18 (60 percent). The male to female ratio was around 3:2. Frozen shoulder is more common in older women.

**Table 2:** Side Involved

Side Involved	No. of Patients	%
Right	13	43
Left	17	57
Total	30	100



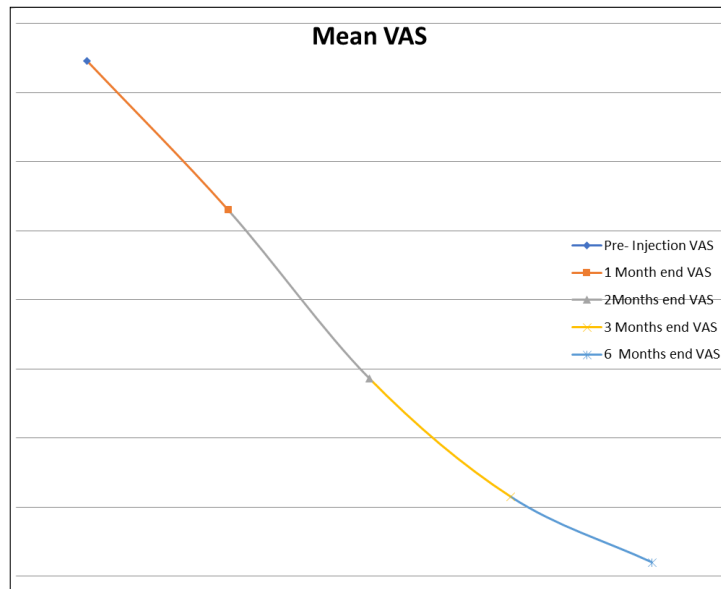
**Fig 2**

In 13 cases (43%), the right side was implicated, whereas in 17 cases (57%), the left side was affected. The non-dominant side was more impacted (n=20, 66.66%). Diabetes mellitus (6 percent), thyroid disease (3 percent),

autoimmune illness (2 percent), and other comorbidities (18 percent) are all associated co-morbidities (64 percent).

**Table 3: Mean Vas Score**

Mean VAS Score	Pre- Injection VAS	1 Month end VAS	2Months end VAS	3 Months end VAS	6 Months end VAS
Mean VAS	7.46	5.3	2.86	1.15	0.2
SD	0.86	0.7	0.86	0.74	0.48

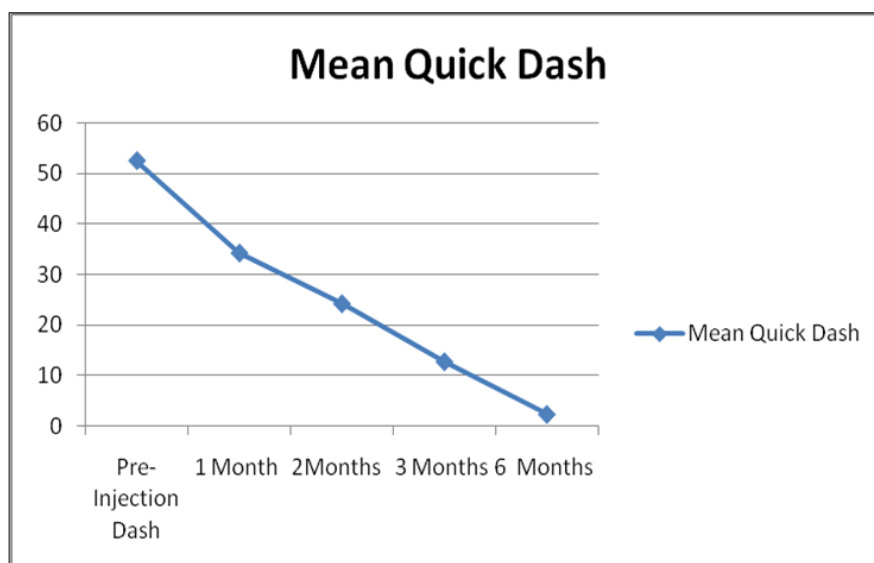


**Fig 3**

At three months, the mean Vas Score was 1.15, which was great because it was lower than the pre-injection VAS Score of 7.46. (SD. 0.86). At the three-month follow-up, 10 patients had no discomfort and 20 had minor pain. While the mean VAS score at 6 months was 0.2 (SD 0.48), this was a great improvement from the pre-injection mean VAS score of 7.46. The ultimate follow-up found that 26 individuals had no discomfort and four patients had minor pain. During each follow-up, the mean score improved consistently, and each score was statistically significant when compared to the prior follow-up.

**Table 4: Mean Q DASH Score**

	Pre- Injection Dash	1 Month	2 Months	3 Months	6 Months
Mean Quick Dash	52.6	34.33	24.3	12.81	2.4
SD	6.19	6.8	5.63	6.11	3.7



**Fig 4**

The QDASH rating system was employed in our study as a functional and pain grading method. The average pre-injection score was 52.6. (SD 6.19). The mean QDASH score at 6 months was 2.4 (SD 3.7), which was good. The mean score improved consistently with each follow-up, and each score was statistically significant when compared to the prior follow-up.

After the injection, ten individuals (33.33 percent) report no discomfort.

### Discussion

Frozen shoulder is considered to be the disease of a person between the ages of fourteen and seven. We often attack women more than men. An unruly limit involves more often than the ruling limit. These epidemiological conclusions were well supported in the literature. In patients with diabetes mellitus, thyroid disease and other systemic problems (such as autoimmune disease), minor microvascular problems lead to abnormal collagen repair, which can easily lead to frostbite. In patients with diabetes mellitus due to non-enzymatic glycosylation of collagen and deterioration of the matrix tissue linked by local metalloproteinase enzyme leads to frozen shoulder. Genetics may also play a role.<sup>[7]</sup> In our study of 30 patients 6 patients (20%) had diabetes. 3 patients (10%) had thyroid problems. Autoimmune disease in 2 patients (6%). As well as other diseases in 18 patients (64%). This result was similar to other studies by Matthew Tran and Steven D. Stovitz et al (March 2021) in which the total prevalence of thyroid disease was 17.7% (113/638), and the prevalence of diabetes was 49.8% (318) / 638).<sup>[8]</sup> The median duration of pain duration before the PRP injection was 2.6 (SD  $\pm$  0.89) after the PRP injection duration of pain was 4.06 (SD  $\pm$  0.94) and the p value was 0.0001 respectively. Withers et al found that pain is resolved within two to four months. The average seizure in the pre-PRP series was 67.33° and after 12-week PRP follow-up was 134.33 (11.65) and after 6-month follow-up was 162.33 (11.94). The rate of flexion before PRP was 63 ° and after the end of PRP week 12 follow-up was 134.33 (11.65) and after 6 months was 162.33 (11.94). This result was similar to the studies of Shashank Yashwant Kothari et al in their study the average seizure at 12 weeks was 142.3 (22.9) and the end of flexion at the end of 12 145.5 weeks (13.5).<sup>[9]</sup> The mean external rotation of the affected shoulder before PRP was 28.33° and after PRP at the end of the follow-up was 64.66. Which was similar to the M study. Waldburger et al (40°).<sup>[10]</sup> To examine the internal circulation, we used the anatomical mark of the sacrum, i.e., below the sacral level, down to the sacral level and above the sacral level. Every patient is restricted to internal circulation and has internal circulation not at the sacrum level, after the end of the PRP follow-up patient (20) has reached internal circulation above the sacrum level. The most realistic scoring system for frozen shoulder taken from many recent studies was the Q DASH (Hand, Shoulder and Hand Hand) scoring system. In our study the Quick Dash score before PRP treatment was 52.60  $\pm$  6.19, while after PRP treatment, the score was 36.08  $\pm$  6.2 after 2 weeks, 23.73  $\pm$  5.61 1, 10.23  $\pm$  7.2 months after 3rd month and 2.10  $\pm$  3.82 after 6 months. This result was similar to the study of Aleksandar Jakovljevi et al (2017) Quick Dash score before PRP treatment was 42 (35-52), whereas after PRP treatment, 18 points (13-26) days later of 30 and 13 (11-23) after 3 months.<sup>[11]</sup> In our study VAS score before PRP treatment was 7.4  $\pm$  0.85, while after PRP treatment, points were 4.93  $\pm$  0.73 after 2 weeks, 2.66  $\pm$  0.60 after 1 month, 0.83  $\pm$  0.69 after 3 months and 0.16  $\pm$  0.46 after 6 months. This result is similar to a previous study by Shashank Yeshwant Kothari et al (2017), in whose study the mean VAS score of 8.4  $\pm$  1.4, after 3 6.4  $\pm$  1.6 weeks, after 6 4.2  $\pm$  1.9 weeks and weeks later 121.9  $\pm$  1.8.<sup>[12]</sup>

### Conclusion

In the present study an autologous PRP intra articular injection was found to be helpful in reducing pain and increasing various movements throughout the frozen shoulder patient. The procedure was not as serious as infection or deterioration of a pre-existing condition. The median dose of pre-VAS injection and Q DASH school improved significantly compared to post injection mean VAS and Q DASH scores. Conventional treatment is still the most widely used and PRP treatment for frozen shoulder is an acceptable and relatively new method that offers a more effective alternative to frozen shoulder. As it is a new strategy, PRP treatment requires further testing. The symptoms relieve symptoms quickly, reduce chronic illness and quickly return to normal daily activities. These are important points in the adoption of PRP.

### Reference

1. Lundberg BJ. The frozen shoulder. Clinical and radiographical observations. The effect of manipulation under general anesthesia. Structure and glycosaminoglycan content of the joint capsule. Local bone metabolism. *Acta Orthop Scand Suppl*,1969:119:1-59.
2. Smrke D, Gubina B, Damanovic D, Rozman P. Allogeneic platelet gel with autologous cancellous bone graft for the treatment of a large bone defect. *Eur Surg Res*,2007:39:170-4.
3. Anitua E, Andia I, Ardanza B, Nurden P, Nurden AT. Autologous platelets as a source of proteins for healing and tissue regeneration. *Thromb Haemost*,2004:91:4-15.
4. Bucholz RW, Einhorn TA, Marsh JL. Bone and joint healing. In: Bucholz RW, Heckman JD, Court-Brown C, eds. *Rockwood & Green's fractures in adults*. Sixth ed. Lippincott Williams & Wilkins,2006:300-11.
5. Gould D et al. Visual Analogue Scale (VAS). *Journal of Clinical Nursing*,2001:10:697-706.
6. Streiner DL, Norman GR. *Health measurement scales: a practical guide to their development and use*. New York; Oxford University Press,1989:10:1117-1127

7. Specialty Update: Upper Limb Frozen shoulder CM. Robinson, K. T. M Seah, Y. H. Chee, P. Hindle, I. R. Murray from Edinburgh Shoulder Clinic, Edinburgh, United Kingdom. *J Bone Joint Surg Br*,2012;94-B:1-9.
8. Tran M, Stovitz SD. Prevalence of Diabetes Mellitus and Thyroid Disease in Patients Diagnosed with Adhesive Capsulitis (Frozen Shoulder). *Ann Sports Med Res*,8(2):1178.
9. Kothari SY, Srikumar V, Singh N. Comparative Efficacy of Platelet Rich Plasma Injection, Corticosteroid Injection and Ultrasonic Therapy in the Treatment of Periarthritis Shoulder. *J Clin Diagn Res*,2017;11(5):RC15-RC18. Epub 2017 May 1. PMID: 28658861; PMCID: PMC5483763.
10. Management of adhesive capsulitis of shoulder joint by single platelet rich plasma injection. Alok Chandra Agrawal, Buddhadeb Nayak, Harshal Sakale ORIGINAL ARTICLE Year. *Journal of orthopedics, traumatology and rehabilitation*,2019;11(1):62-65.
11. Neviasser AS, Neviasser RJ. Adhesive capsulitis of the shoulder. *J Am Acad Orthop Surg*,2011;19:536-542. [PubMed] [Google Scholar]
12. Shashank Yeshwant Kothari, Venkataraman Srikumar, Neha Singh. Comparative Efficacy of Platelet Rich Plasma Injection, Corticosteroid Injection and Ultrasonic Therapy in the Treatment of Periarthritis Shoulder *J Clin Diagn Res*, 2017, 11(5). PMC5483763